Superfund Program
Proposed Plan

U.S. Environmental Protection
Agency, Region II

Lower Passaic River – Phase I Removal Action

November 2008

PURPOSE OF THIS DOCUMENT

This document describes the response actions considered for the Lower Passaic River - Phase I Removal Action and identifies the preferred response action with the rationale for this preference.

The document was developed by the U.S. Environmental Protection Agency (EPA), in consultation with the New Jersey Department of Environmental Protection (NJDEP). EPA is issuing this document as part of its public participation responsibilities under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The response actions summarized here are described in more detail in the Engineering Evaluation/Cost Analysis (EE/CA) report. EPA and NJDEP encourage the public to review the EE/CA to gain a more comprehensive understanding of the site and the proposed response action.

EPA's preferred response action, which is formally referred to as a non-time critical removal action (NTCRA), consists of the removal and off-site disposal of approximately 40,000 cubic yards (cy) of contaminated sediment from the Harrison Reach of the Lower Passaic River. The removal will be accomplished by a mechanical dredge, operating within a sheet-pile enclosure, followed by mechanical dewatering of the dredged material and off-site disposal.

The response action described in this document is the *preferred* response action for the site. Changes to the preferred response action or a change from the preferred response action to another response action may be made if public comments or additional data indicate that such a change will result in a more appropriate response action. The final decision regarding the selected response action will be made after EPA has taken into consideration all public comments. EPA is soliciting public comment on all of the components of the response actions considered in the detailed analysis of the EE/CA because EPA and NJDEP may select a response action other than the preferred response action.

MARK YOUR CALENDAR:

PUBLIC COMMENT PERIOD:
November 19 – December 19, 2008
U.S. EPA will accept written comments on the Proposed Plan and Phase I EE/CA during the public comment period.

PUBLIC MEETING:
December 2, 7:00pm
U.S. EPA will hold a public meeting to explain the Proposed Plan and all of the alternatives presented in the Phase I EE/CA. Oral and written comments will also be accepted at the meeting. The meeting will be held at the Hawkins Street Elementary School, 8 Hawkins Street, Newark, New Jersey.

For more information, see the Administrative Record at the following locations:
U.S. EPA Region 2 Superfund Records Center
Building 205
2890 Woodbridge Avenue
Edison, NJ 08837-3679
Hours: Mon – Fri: 9AM – 5PM
Phone: (732) 906-6980

Newark Public Library
NJ Reference Section
5 Washington Street
Newark, NJ 07101
Hours: Mon, Fri, Sat: 9AM – 5:30PM
Tues, Wed, Thurs: 9AM – 8:30PM
Phone: (201) 733-7775

This document is being provided as a supplement to the EE/CA to inform the public of EPA's and NJDEP's preferred response action and to solicit public comments pertaining to all the response actions evaluated, as well as the preferred response action.

COMMUNITY ROLE IN SELECTION PROCESS

EPA relies on public input to ensure that the concerns of the community are considered in selecting an effective response action for each Superfund site. To this end, the EE/CA and this document have been made available to the public for a public comment period which begins on November 19, 2008 and concludes on December 19, 2008.

A public meeting will be held during the public comment period at the Hawkins Street Elementary School on December 2 at 7:00 P.M. to present the conclusions of the EE/CA, to further elaborate on the reasons for recommending the preferred response action, and to receive public comments.

Comments received at the public meeting, as well as written comments, will be documented as part of the decision document (called an Action Memorandum) which will formalize the selection of the response action.

Written comments on this document should be addressed to:

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SITE BACKGROUND

On June 23, 2008, EPA Region 2, Occidental Chemical Corporation (OCC) and Tierra Solutions Inc. (Tierra) entered into an Administrative Order on Consent (AOC) for the conduct of a source control removal action of 200,000 cubic yards (cy) of contaminated sediment from the Harrison Reach of the Lower Passaic River. The primary objective of this action is to remove a significant portion of the most concentrated inventory of dioxin-contaminated sediments, thereby removing source material that poses a potential risk to human health and the environment. In accordance with the AOC, the work is being performed as a NTCRA requiring the preparation of an EE/CA. The objective of the EE/CA is to evaluate different alternatives for conducting the action based on three criteria, namely, effectiveness, implementability and cost.

The removal will take place in two discrete phases. Phase I, the subject of this Proposed Plan, will remove approximately 40,000 cy of the most highly contaminated sediment with subsequent treatment and off-site disposal. The work area dimensions for Phase I were predetermined in the AOC by EPA and NJDEP based on a three-dimensional geophysical analysis of sediment coring data in the Harrison Reach designed to maximize removal of sediments containing the highest concentrations of dioxins.

In accordance with the AOC, Phase II, which will be conducted under a separate timeline, will remove an additional 160,000 cy of sediment for disposal in a Confined Disposal Facility (CDF). Phase II will be the subject of a separate EE/CA at a later date.

The Phase I and II work areas are contiguous and are located within the Lower Passaic River Study Area (LPRSA), which is approximately 17 miles long and extends from the Dundee Dam near Garfield, New Jersey to Newark Bay. It was decided to perform the work in two separate phases so that the most contaminated sediments could be removed and disposed of off-site expeditiously. The Phase I work area is located in the Harrison

Reach, at approximately River Mile 3.4, of the Passaic River adjacent to the Diamond Alkali Superfund site. Historical discharges from the Diamond Alkali Site are considered the primary source of dioxin to the Lower Passaic River. From 1951 to 1969, the Diamond Alkali Company operated a facility at 80 Lister Avenue in Newark, New Jersey that manufactured, among other chemicals, herbicides and pesticides from which dioxin (2,3,7,8- tetrachloro-dibenzo-*p*-dioxin (TCDD)) is a by-product. After hazardous substances were detected at the facility, EPA placed the Diamond Alkali Site on the National Priorities List in 1984.

The Diamond Alkali site has been contained since 2004 through the construction of a slurry trench cutoff wall, an engineered cap, a ground water pump and treat system, and a floodwall along the Passaic River. On-going operation and maintenance monitoring and a remedy review conducted by EPA in July 2006, indicate that the remedy is functioning as intended to contain the site.

The Phase I work area is bounded to the north by the navigation channel and to the south by the Diamond Alkali site floodwall and a bulkhead in front of a portion of the adjacent Sherwin-Williams property. Generally, the Phase I Work Area sediment is fine-grained, cohesive material classified as silt and clay. The average flow of the Passaic River near the Phase I Work Area is approximately 1,450 cubic feet per second.

The removal of contaminated sediments will take place entirely within a sealed sheet pile containment structure designed to prevent the release of contaminated sediment into the Lower Passaic River. The Phase I Work is not anticipated to significantly impact the ongoing LPRSA and Newark Bay Remedial Investigation/Feasibility Study (RI/FS) Programs. Furthermore, since all work will take place within the containment structure, which is located outside the navigation channel, impact to commerce on the river is expected to be minimal.

SITE HISTORY

After the Diamond Alkali Superfund Site was placed on the National Priorities List, an RI/FS was conducted at the Diamond Alkali plant, which included the sampling and assessment of sediment contamination within the adjacent Passaic River. Pursuant to a 1990 Consent Decree, OCC implemented a 1987 Record of Decision for an interim remedy at the plant, which included a cap and wall around the property, and a pump and treat system to contain contaminated ground water. Sampling of sediments in the Passaic River revealed many hazardous substances including, but not limited to dioxins and furans (including 2,3,7,8-TCDD), dichlorodiphenyl-trichloroethane (DDT), polychlorinated biphenyls (PCBs), polyaromatic hydrocarbons (PAHs), mercury, cadmium, copper, lead, nickel, and zinc.

In 1994, OCC signed an AOC with EPA to investigate a six-mile stretch of the Passaic River centered on the Diamond Alkali plant. A significant portion of the RI was completed by OCC. It showed that evaluation of a larger area was necessary because sediments contaminated with hazardous substances and other potential sources of hazardous substances are present along at least the entire 17-mile tidal stretch of the Passaic River and were further dispersed by the tidal nature of the Lower Passaic River. As a result, in January 2001, EPA directed OCC to suspend work under the AOC.

EPA and a partnership of federal and State of NJ agencies undertook a joint CERCLA-Water Resources Development Act (WRDA) study of the 17-mile tidal stretch of the Passaic River (the LPRSA). That work is on-going. During the course of the 17-mile study, the sediments of the lower eight miles of the Passaic River were found to be a major source of on-going contamination to the tidal river and Newark Bay. Therefore, EPA, NJDEP and the other partner agencies are developing a Focused Feasibility Study (FFS) to evaluate taking an early action to address that major source of on-going contamination.

The sampling performed as part of these several investigations in the river sediment adjacent to the site provides the information necessary to support the current action.

SUMMARY OF SITE INVESTIGATIONS AND EXTENT OF CONTAMINATION

Sediment coring data from the Lower Passaic River has shown the Harrison Reach to contain the most concentrated inventory of dioxin-contaminated sediments. The maximum detected concentration of 5,300 parts per billion (ppb) of dioxin (2,3,7,8-TCDD) in the Harrison Reach is located within the Phase I work area at River Mile 3.4. The coring data also show that the stretch of sediments to the east and west of River Mile 3.4 have concentrations over 100 ppb. Much of this area falls within the Phase II removal work area.

In general, chemical data from the Phase I Work Area indicate that the highest contaminant levels of dioxins, metals, and other constituents were found deeper than 2 ft below sediment surface with concentrations tending to decrease to relatively low levels by 12 ft deep in the sediment profile. Samples collected closer to shore also tend to exhibit more elevated concentrations as compared to those collected farther from shore.

The Phase I work area lies mainly in a mud flat between the Diamond Alkali site floodwall and the navigation channel on the south bank of the Passaic River. Although these high levels of dioxin are not currently within the biologically active zone, there is the potential for these highly toxic sediments to become exposed should an extreme storm event erode away the overlying sediments. EPA and NJDEP believe these sediments pose a serious threat, because their dioxin concentrations are well over three orders of magnitude greater than the average surface sediment dioxin concentrations in the rest of the river (0.8 ppb), and their highly toxic concentrations would pose significant risk to human health or the environment should exposure occur.

The site data used to help define the dimensions of the Phase I work area consisted of seven surface grab samples and 90 cores collected by Tierra in 1995 and ten additional cores collected by Malcolm Pirnie in 2006. The horizontal and vertical dimensions (750 ft L X 135 ft W X 12 ft D) of the Phase I work area were determined by EPA and NJDEP by analyzing the historical bathymetry and the Tierra and Malcolm Pirnie data sets using a geostatistical analysis program named "Mining Visualization System 3D." The details of this analysis are available in the administrative record for the removal action.

Based on information available, EPA has determined that the sediments do not contain a listed hazardous waste. However, the existing data suggest that some of the dredged material will have the potential to be designated as a characteristic hazardous waste. This means that the dredged material will have to be disposed of off-site either by incineration or in a RCRA Subtitle C landfill.

Based upon observations from a number of geophysical surveys conducted in the vicinity of the Phase I work area, it is assumed that a variety of debris will be encountered during sediment removal operations and will need to be removed, as a separate operation before dredging.

SUMMARY OF SITE RISKS

Human Health and Ecological Risk

A quantitative baseline human health and ecological risk assessment for chemical constituents in sediment and the food web (e.g., fish, crabs, other organisms in the river) of the LPRSA, including the Phase I Work Area, is being performed as part of the ongoing 17 mile Remedial Investigation/Feasibility Study (RI/FS). The Phase I Work, including the post-removal conditions, will be considered and evaluated under the

RI/FS program. The EE/CA contains a streamlined risk evaluation, consistent with guidance on removal actions, that identifies and summarizes the human health and ecological exposures to the contaminants within the Phase I work area and discusses the potential reduction of exposures to these contaminants as a result of the Phase I Removal Action.

Summary of Potential Exposures

The available data demonstrate that the sediments within the Phase I Work Area, both at the surface and especially at depth, are contaminated with a variety of chemical constituents including dioxins, metals and other constituents that could pose a potential risk in the event that these materials are mobilized and become available within the river. As shown in a Conceptual Site Model of the EE/CA, the sediment in the Phase I Work Area, both at the surface and at depth, is contaminated with a variety of chemical constituents, many of which are present at levels that: would present unacceptable risks to both human and ecological (wildlife) receptors, are transferred into the food web, and may be transported to other areas of the river.

The actual exposure risks and transport dynamics cannot be quantified in this evaluation, but the exposure potential for both humans and ecological receptors can be qualitatively characterized. The following sections qualitatively describe human health and ecological risks.

Human Health: Potential human exposures to chemical contaminants include receptors such as anglers (i.e., people who fish) and crabbers potentially catching and consuming fish/shellfish (e.g., crabs) from this area as well as boaters and workers in the area. These exposures are primarily through ingestion of contaminated fish or shellfish from the river, dermal contact and/or incidental ingestion of sediment and/or water. Inhalation of volatile or semivolatile organic compounds from sediment or water is another potential exposure pathway, but not as significant as the ingestion and direct contact pathways. These contaminants have been associated with a variety of adverse health effects including a risk of cancer.

The State of New Jersey, recognizing the widespread chemical contamination of fish and shellfish in the lower Passaic River from dioxin, PCBs and mercury, has prohibited the sale or consumption of all fish and shellfish from this area since the 1980s.

Ecological Assessment: Ecological receptors in the Phase I Work Area include a range of invertebrate and vertebrate organisms that inhabit or utilize the river either year round or on a migratory basis. These primarily include benthic invertebrates, shellfish (primarily blue crabs), fish, birds (both shorebirds and passerines) and mammals. Exposures for all of these groups can include both direct contact with sediment and water, as well as indirect uptake of bioaccumulative chemical constituents through food web (i.e., feeding) interactions.

Risks: The current risks in the Lower Passaic River are associated with an average concentration of 800 part per trillion (0.8 parts per billion) of dioxin (2,3,7,8 –TCDD) in the surface sediment. The maximum concentration found at depth is in the thousands of parts per billion range which is orders of magnitude greater than the current surface concentration. The actual exposure risks and transport dynamics were not quantified in this evaluation. However, the possibility exists that the material at depth may become available in the estuary. The potential release of these high levels of dioxin found at depth from the Phase I work area would have long-lasting adverse impacts on the estuary.

Conclusions: The results of the qualitative risk evaluation indicate that there would be a significant risk to human health and the environment from exposure to sediment within the Phase I work area if these sediments were released into the water column. The release of these highly contaminated sediments could adversely impact ecological receptors, such as invertebrates, fish, birds and mammals that use the river. In addition to adverse impacts to the environment, the contaminants in the sediment could be taken up through the food web where people may consume contaminated fish and crabs. Therefore, conditions at the site meet the criteria for a removal action under CERCLA, as documented in Section 300.415(b)(2)(i) of the NCP, namely, the actual or potential exposure of nearby people to hazardous substances.

REMOVAL ACTION OBJECTIVES

The sediment cleanup goals for the Phase I removal action are tied to the goal of source removal. As there are no sediment cleanup levels to meet, there will be no post excavation sampling upon completion of the work. The objective is to remove source material at depth and thereby eliminate the risk related to the potential resuspension of these sediments into the water column where they may become part of the food web in the future.

The following removal action objectives (RAOs) were established for the site:

- Remove a portion of the most concentrated inventory of dioxin (2,3,7,8 - TCDD), and other hazardous substances, to minimize the possibility of migration of contaminants due to extreme weather events.

- Prevent, to the maximum extent practicable, the migration of resuspended sediment during removal operations through appropriate engineering controls, monitoring, etc.

- Prevent, to the maximum extent practicable, the potential for spillage or leakage of sediment and contaminants during transport to the disposal facility.

- Restore habitat. (Restoration of the Phase I Work Area will be coordinated with the activities of the bordering Phase II work and may not occur until Phase II is completed.)

EPA has determined that a NTCRA is warranted to minimize, or eliminate these potential threats to human health, welfare, or the environment. The proposed response action is considered non-time critical because, although there is a threat to public health, welfare, or the environment, there is sufficient planning time available before the removal action must be initiated.

REQUIREMENTS OF THE AOC

The June 23, 2008 AOC requires the removal and off-site disposal of approximately 40,000 cy of contaminated sediment from within a predetermined area called the Phase I work area. As previously discussed in the Site Background section, the dimensions of the Phase I work area and the amount of contaminated sediment to be removed were determined by EPA and NJDEP. It was also determined, and made a requirement of the AOC, that Tierra conduct the removal of contaminated sediments from within a sheet-pile enclosure to mitigate the potential for sediment resuspension and contaminant release during dredging. Consequently, the response actions developed during the EE/CA process were designed to reflect these baseline requirements of the AOC. Therefore, the EE/CA did not evaluate other alternatives such as capping or in-situ stabilization because they would not meet the requirements of the AOC as described above.

RESPONSE ACTION COMMON ELEMENTS

As per the AOC, the Phase I EE/CA focuses solely on development of alternatives for sediment removal, processing and disposal activities. All of the Phase I work alternatives assumed that upland activities, including staging, sediment and debris processing, and water treatment will occur at a property in close vicinity to the work area.

The four alternatives, while differing in technology and methodology to achieve the baseline requirements of the AOC, share a number of common components which are described below.

Sheet-Pile Enclosure

As directed by the AOC, all four Phase I Work Alternatives involve the removal of 40,000 cy of sediment from within a sealed sheet pile enclosure. Accordingly, all alternatives involve the construction of a sheet pile enclosure that will be designed to minimize, to the maximum extent practicable, the migration of resuspended contaminated sediment from the Phase I work area.

The conceptual design anticipates that the sheet piles for this enclosure will be driven into a deep silty clay layer with low permeability. A sealant will be applied to the joints to reduce the interlock permeability. These measures will contain resuspended sediment within the Phase I Work Area, preventing the dispersion to the maximum extent practicable. The depth of the sheet piles and the sealant will limit hydraulic connectivity between the Phase I Work Area, the Passaic River, and Diamond Alkali site floodwall.

Due to concerns about air quality impacts and potential risks to foraging birds from exposed sediments and groundwater infiltration leading to destabilization of the sheet-pile enclosure, it was decided to remove sediment "in the wet." This means that the river water level will be maintained within the sheet-pile enclosure during dredging operations in order to ensure the integrity of the wall and surrounding structures including the Diamond Alkali site flood wall.

Debris Handling/Solids Separation

As it is expected that a variety of large and small-sized debris will be encountered during the removal action, a debris survey will be conducted to identify debris that are expected to be present in the Phase I Work Area. A Grizzly screen or equivalent device will be needed to remove large solids, including smaller debris, that may damage the dewatering equipment and minimize functionality. Solids separation, to protect the sediment processing equipment, may also include the removal of sand-sized solids via hydrocyclone.

Once removed and stockpiled, over-sized debris will be pressure washed. Over-sized debris, such as cars, logs or other large objects, will be removed mechanically and handled separately from the sediment. The rinse water will be collected for subsequent treatment, and the sediment will be collected for processing.

Water Treatment and Discharge

Treatment of collected water from removal and processing operations will be required prior to discharge to the Passaic River. Water that will be treated includes decontamination water and that which is generated during sediment and debris processing. River-water within the sheet-pile enclosure may also require treatment prior to removal of the structure. It is anticipated that a dedicated water treatment plant, which includes physical and chemical processes, such as flocculation, clarification, multimedia filtration, and granular-activated carbon adsorption will be constructed on an adjacent property. Similar water treatment plants have been successfully used at other sites containing similar contaminants.

Off-site Transport of Sediment

Transportation and off-site disposal is another common component of all four alternatives. Transport technologies screened in the EE/CA include transport by rail, barge and truck. Of the three, EPA strongly prefers either rail or barge or a combination of both. Transport by truck is the least preferable mode because the large number of trucks required may produce a potential risk and a nuisance to the surrounding community (i.e., diesel fumes, noise, potential accidents). Therefore, properties that provide access to barge and rail transport are currently being evaluated as upland sediment processing locations.

The final transport approach cannot be determined until the selection of the off-site treatment and disposal facilities, because the two are closely linked. For the purposes of the Phase I EE/CA, rail or barge transport of sediment from the upland processing site to the receiving facility was assumed as the method of transport, with some trucking from the rail/barge depot to the receiving facility included in the evaluation.

Regardless of the method of transport, sediment will be transported in sealed intermodal containers. This will allow movement of the sealed container from one transport technology to another, if needed, without direct contact with the sediment. The use of sealed intermodal containers will also minimize the potential for the release of sediment during transport. Whether debris, as distinct from sediment, is transported in a sealed intermodal container will depend on the nature and size of the debris.

Off-Site Treatment and Disposal

Off-site treatment and disposal of the removed sediment is required per the AOC. Based on existing analytical data, a portion of the sediment has the potential to be classified as a characteristic hazardous waste due to the presence of hazardous constituents above the toxicity regulatory levels. The mean concentration of dioxin, based on the historical sediment sampling results from within the Phase I work area, is 244 ppb. Because this value is greater than the universal treatment standard (UTS) of 1 ppb, it was assumed for the purposes of the Phase I EE/CA that some of the sediment will require treatment (most likely incineration but the possible use of oxidizers and polymers will be considered as well) prior to disposal. Other than the sediment that contains characteristic hazardous waste or contains dioxin levels above 1 ppb, it is likely that the remainder of the sediment will not require treatment prior to land disposal. During design, the percentage of sediment requiring treatment will be refined further.

Backfilling

Following sediment removal, the Phase I Work Area will be restored by backfilling to at or near pre-removal surface elevations. Backfill materials and placement methods will be determined during design. Restoration of the Phase I Work Area will also need to consider the schedule and activities of the Phase II Work. Backfill materials will meet appropriate criteria for an estuarine environment.

Monitoring

Water quality monitoring and air monitoring will begin prior to the start of work to establish baseline conditions against which to compare during and after construction. The monitoring results will be used to assess impacts to the workers' well being and that of the surrounding community and environment. It is anticipated that monitoring will be conducted throughout the duration of the Phase I Work, including health and safety monitoring, water quality and water treatment discharge monitoring and air monitoring. To share these data with the community in a timely manner, monitoring results will be posted on a publicly accessible web site, and other means as appropriate.

Health and Safety

A health and safety plan will be developed for on-site workers. A separate health and safety plan for the community will be developed as described in the Community Involvement section below.

Community Involvement

A number of decisions that have the potential to impact the community will be made in the design phase of the Phase I Work. EPA has developed a draft Community Involvement Plan (CIP) for the removal project to guide the community outreach and input process throughout both phases of the removal. The CIP will be finalized concurrent with issuance of the Action Memorandum and will reflect community input received during the public comment period on the Phase I EE/CA and this Proposed Plan. Tierra will work together with EPA, NJDEP, and community members to ensure that quality of life issues such as noise, odor, road traffic, navigational traffic, water quality, air quality, and light are accounted for during design. A Community Health and Safety Plan (CHASP) will be developed as part of the project design. It will address community health and safety issues that will need to be considered in the removal project implementation.

The CHASP will, at a minimum, provide for the use of "clean diesel" technology for the heavy equipment that will be used for on-site dredging and materials handling. Clean diesel technology includes the use of air pollution control devices to minimize emissions of fine particulate matter, and the use of ultra-low sulfur diesel fuel to protect such equipment and further reduce particulate emissions. Use of clean diesel technology, to the maximum extent practicable, will dramatically reduce particulate emissions associated with this work, and will help protect the local community from risks associated with such emissions.

The CHASP will also consider other practicable ways in which to reduce the environmental "footprint" of the response work (including the direct and indirect emission of greenhouse gases).

SUMMARY OF RESPONSE ACTIONS

The following alternatives were developed in accordance with EPA's guidance on conducting Non- Time-Critical Removal Actions Under CERCLA (USEPA, August 1993) and the AOC:

Alternative A: Hydraulic removal with geotextile tube processing

Alternative B: Hydraulic removal with mechanical processing

Alternative C: Mechanical removal with mechanical processing

Alternative D: High-solids pump removal with mechanical processing.

Alternative A: Hydraulic Removal with Geotextile Tube Processing

In addition to the common elements described above, Alternative A will employ hydraulic dredging to remove the sediment from within the Phase I work area. Hydraulic dredging removes sediment from the work area with suction and the force of a rotating cutter head or horizontal auger to loosen the sediment. The sediment would then be pumped as a slurry through a pipeline to the upland processing site, where it will be put on a Grizzly screen and moved through the screen by shaking and water jets. This step will separate out the small debris. The sediment will then be put in a hydro-cyclone to separate the coarser sediment (sand) from the finer sediment, since the larger solids may damage the dewatering equipment and prevent it from functioning properly.

The geotextile tubes will be staged on top of a liner, such as a geomembrane, with perimeter berms so that the decant water from the geotextile tubes will be contained and ultimately collected in a sump. Geotextile tubes are made of high strength, permeable materials which retain the sediment while allowing the water to drain out. Water treatment will be conducted throughout the duration of the geotextile tube dewatering as the decant water is generated. Once the dewatering in the geotextile tube is completed, the geotextile tubes will be opened and sampled to determine the appropriate disposal method. Other in-water activities, such as backfilling and sheet pile removal, will be conducted in parallel with geotextile tube dewatering once sediment removal is complete.

Alternative A will take approximately 27 weeks to complete removal and backfilling. This does not account for subsequent activities (e.g., time to dewater sediment in geotextile tubes, sheet pile removal, remaining off-site transport and disposal, and demobilization). The total estimated cost for Alternative A is $53,900,000. Appendix A of the Phase I EE/CA provides a breakdown of the costs, as well as a summary of the assumptions made to develop the costs. In accordance with the EPA cost-estimating guidance, the costs are intended to be estimates within a -30 to +50 percent range.

Alternative B: Hydraulic Removal with Mechanical Processing

Alternative B is similar to Alternative A in that it uses hydraulic dredging to remove the sediment from the Phase I Work Area. The major difference is that the sediment slurry will be mechanically dewatered by squeezing or pressing water from the sediment using a filter press, belt press, or equivalent. The resulting dewatered sediment will be stockpiled and covered on the upland processing site pending characterization and off-site disposal.

Alternative B will take approximately 27 weeks to complete removal and backfilling. This does not account for subsequent activities (e.g., sheet pile removal, remaining off-site transport and disposal, and demobilization). The total estimated cost for Alternative B is $49,100,000. In accordance with the EPA cost-estimating guidance, the costs are intended to be estimates within a -30 to +50 percent range.

Alternative C: Mechanical Removal with Mechanical Processing

In addition to the common elements described earlier, Alternative C will employ mechanical dredging to remove the sediment from the Phase I Work Area. Mechanical dredging uses the mechanical action of a bucket or scoop to excavate the sediment at near in-situ density. The mechanical dredge, operated from a barge, would excavate sediment using an environmental bucket and place dredged material on another barge within the sheet pile enclosure. The barge would then navigate to the upland processing site within the sheet pile enclosure and be unloaded using excavators. The mechanically dredged material will be passed through a Grizzly screen to remove debris and then slurried by adding water. Another possible approach would be to place the sediment directly into a hopper on a barge. The hopper would serve the same function as the Grizzly screen to remove debris. After the sediment has passed through the hopper, it would be slurried on the barge and pumped to the upland processing site for sediment processing. The sediment slurry will then pass through a hydrocyclone to separate out the sand fraction of the material. Following the hydrocyclone step, the resulting fine-grained sediment slurry will be mechanically dewatered using a filter press, belt press, or equivalent, and the resulting dewatered sediment will be stockpiled and covered on the upland processing site pending characterization for off-site disposal.

Alternative C will take approximately 29 weeks to complete removal and backfilling. This does not account for subsequent activities (e.g., sheet pile removal, remaining off-site transport and disposal, and demobilization). The total estimated cost for Alternative C is $44,700,000. In accordance with the EPA cost-estimating guidance, the costs are intended to be estimates within a -30 to +50 percent range.

Alternative D: High Solids Pump Removal with Mechanical Processing

In addition to the common elements described earlier, Alternative D will utilize a high solids pump to remove the sediment from the Phase I Work Area. High solids pumping consists of a submersible pump (Toyo or Eddy pump) attached to a flexible pipe and suspended from a barge-mounted crane, excavator arm or ladder. The continuous suction pumping will remove the sediment and nearby water as a slurry. The sediment slurry will then be transported through a pipeline to the upland processing site. After the Grizzly screen and hydrocyclone steps, the resulting fine-grained sediment slurry will be mechanically dewatered using a filter press, belt press, or equivalent, and the resulting dewatered sediment will be stockpiled and covered on the upland processing site pending characterization for off-site disposal.

Alternative D will take approximately 27 weeks to complete removal and backfilling. This does not account for subsequent activities (e.g., sheet pile removal, remaining off-site transport and disposal, and demobilization). The total estimated cost for Alternative D is $45,100,000. In accordance with the EPA cost-estimating guidance, the costs are intended to be estimates within a -30 to +50 percent range.

EVALUATION OF RESPONSE ACTIONS

To select a response action for a site, EPA conducts a detailed analysis of the viable response actions. The detailed analysis consists of an assessment of the individual response actions against each of three evaluation criteria (effectiveness, implementability, and cost) and a comparative analysis focusing upon the relative performance of each response action against those criteria.

Effectiveness

This criterion refers to a response action's ability to meet the RAOs. The overall assessment of effectiveness is based on a composite of factors, including overall protection of human health and the environment and compliance with Applicable and/or Relevant and Appropriate Requirements (ARARs).

Overall Protection of Human Health and the Environment assesses whether the response actions are protective of human health and the environment including the community and workers during implementation. The evaluation will focus on how each response action achieves adequate protection and describe how the response action will reduce, control, or eliminate risks at the site through the use of treatment, engineering, or institutional controls.

Compliance with ARARs addresses whether or not a response action would meet all of the applicable or relevant and appropriate requirements of other federal and state environmental statutes. Other federal or state advisories, criteria, or guidance are To Be Considered (TBC) criteria. TBCs are not required by the NCP, but may be useful in determining what is protective of a site or how to carry out certain actions or requirements.

Implementability

Under this criterion, the ease of implementing the response actions will be assessed by considering the following factors: technical feasibility, including technical difficulties and unknowns associated with the construction and operation of a technology, the reliability of the technology, ease of undertaking additional response actions, the ability to monitor the effectiveness of the response action, and the extent to which the removal action contributes to the efficient performance of any long-term remedial action; administrative feasibility, including activities needed to coordinate with other offices and agencies, the ability to obtain necessary approvals and permits from other agencies (for off-site actions) and the ability to meet the time frame laid out in the AOC; availability of services and materials, including the availability of adequate on or off-site treatment, storage capacity, and disposal capacity and services; and the availability of necessary equipment and specialists, and provisions to ensure any necessary additional resources; and the availability of prospective technologies for full-scale application. This criterion will also assess state and community acceptance, as described below.

State Acceptance indicates whether, based on its review of the EE/CA and this document, the State agrees with, opposes, or has no comment on the preferred response action at the present time.

Community Acceptance, which will be assessed in the Action Memorandum, refers to the public's general response to the response actions described in the EE/CA and this document through comments received during the public comment period and those provided at the public meeting.

Cost

The costs that will be assessed include the capital costs, including both indirect and direct costs.

COMPARATIVE ANALYSIS OF RESPONSE ACTIONS

A comparative analysis of the response actions based upon the evaluation criteria noted above follows:

Effectiveness

Overall Protection of Human Health and the Environment

It is expected that all four EE/CA removal alternatives could meet the RAOs and the threshold criteria for protection of human health and the environment through the removal of highly contaminated sediment from the Passaic River within a sealed sheet pile enclosure designed to prevent the migration of resuspended sediment into the surrounding environment.

Protectiveness

Alternatives A and B are both considered to have the greatest overall protectiveness, because they both employ hydraulic dredging, which removes the sediment within the water column and transfers it via pipeline to the processing equipment, thereby significantly reducing exposure of the material to on-site workers and the community. Alternative C is considered somewhat less protective because mechanical dredging will remove the sediment out of the water column and place it into a barge to await upland processing. Comparatively, this process results in greater potential exposure to on-site workers and the community than the hydraulic alternatives. However, engineering controls, such as plastic sheeting and berms, and best management practices, such as requiring the excavator operator to limit the unloading rate of the barges, will be applied to mitigate the impacts of spilled material.

Alternative D is considered the least protective because of the potential for the high solids pump to clog with debris and vegetation, requiring the workers to clear the pump inlet manually and, in turn, increasing their exposure risk. All of the alternatives have similar potential for worker exposure risk in the sediment and debris processing and transport operations.

Ability to Achieve RAOs

Alternatives A, B, C and D are equally competent in their ability to achieve a high level of compliance with the RAOs.

Compliance with ARARs

It is expected that all four EE/CA removal alternatives can be designed and implemented to meet ARARs and the need for waivers is not expected at this time. Furthermore, the non-common elements among the alternatives, such as utilizing mechanical dredging as opposed to hydraulic dredging or mechanical dewatering as opposed to geotextile tube processing do not have any bearing on the ARARs.

No federal, State or local permits are required for CERCLA response actions that are conducted on-site, although such response action will comply with substantive federal or State requirements. Any activities within the Phase I work area or sediment processing or transfer facilities would be considered "on-site" for the purposes of CERCLA Section 121(e)(1), 42 U.S.C. § 9621(e)(1) and the NCP.

Implementability

Technical Feasibility

All alternatives require the use of sheet piles for containment of the Phase I Work Area. This technology is commonly used in relatively small volume sediment removal projects that are close to the shoreline and has been proven effective in preventing the dispersion of resuspended sediment during dredging. The containment also allows sediment to be removed at a consistent production rate, without requiring operational controls or other engineering controls to mitigate resuspended sediment from migrating away from the Phase I Work Area. The sheet pile enclosure also provides excavation support and shoreline structural stability during the removal and maintains a consistent water depth through the duration of the removal by mitigating the impacts of the tidal cycles within the Phase I Work Area. However, the potential for sediment scour outside of the sheet pile enclosure exists and has been initially assessed in the Phase I EE/CA for purposes of estimating costs (i.e., scour mitigation/protection). This issue will be further evaluated during design.

Alternative C is expected to have the highest degree of technical feasibility of the four alternatives. Alternative C is ranked highest due to the ability of mechanical dredges to accommodate a wide range of debris encountered during dredging, while the same debris might shut down a smaller hydraulic dredge. Although a debris survey won't be performed until the design phase, the historic industrial usage of this area and historical experience of dredgers in the general area, have shown that both metallic (such as cables and chains) and organic (such as timber and wood pilings) debris can be anticipated to be encountered in the Phase I Work Area. The presence and nature of debris is often the determining factor in the selection of dredging equipment. Alternative C also has the ability to remove sediment close to shoreline structures. In addition, Alternative C employs mechanical processing which is very effective in dewatering silty, cohesive sediment. However, removing the sediment using mechanical dredging techniques may require two additional handling steps when applied in conjunction with mechanical dewatering, as compared to hydraulic or high solids pump dredging. In addition, the hydrocyclone used to remove the sand content of the sediment and the mechanical dewatering all require a sediment slurry with a low solids content to adequately process the material. Therefore, water will have to be added to the mechanically removed sediment to create a slurry of sufficient water content for processing.

The production rates achievable with a mechanical dredge will not diminish its ability to remove the sediment within the established schedule, despite these additional steps.

Alternatives A, B and D have the ability to transfer the sediment from the Phase I Work Area to the upland processing site seamlessly without requiring additional handling, but do not effectively manage the presence of debris. Alternative D, using high solids pumps, also has the ability to successfully remove sediment close to the containment enclosure. Alternative A is the least technically feasible alternative, due to the inability of hydraulic dredging to manage or remove debris effectively, and the potential that geotextile tubes might be less effective in dewatering silty, cohesive sediment, which may require additional drying in stockpiles. Hydraulic and high solids pump removal technologies may also have a comparatively greater degree of difficulty in removing sediment of high plasticity, as compared to mechanical technologies, which will be a factor with depth in this Phase I

Work Area where water content may decrease and bulk density may increase. Conversely, the portion of sediment that is high in liquid content and is debris free may more readily be drawn into the intake of a hydraulic dredge or high solids pump than a mechanical dredge.

Availability

Alternative A is ranked highest for availability because hydraulic dredges are widely available, and equipment and materials required for geotextile tube dewatering will be more easily procured than those for mechanical dewatering. Although geotextile tubes require a larger amount of upland space, the space is readily available at the upland site; therefore, this constraint would be diminished. Alternative C ranks medium for availability because mechanical dredges are widely available but mechanical dewatering equipment will require procuring more equipment and infrastructure than that required for geotextile tubes. Alternative B is also ranked medium because hydraulic dredges are readily available, and mechanical dewatering equipment will require procuring more equipment and infrastructure than that required for geotextile tubes. Alternative D is ranked low because high solids pumps are not as readily available as hydraulic or mechanical dredges, and mechanical dewatering equipment will not be as readily available as geotextile tubes. All of the alternatives have equal limitations with regard to the availability of laboratory turnaround time for analytical sample results and throughput rate at the available treatment and disposal facilities.

Administrative Feasibility

The alternatives have similar administrative feasibilities. They all require the construction of a sheet pile enclosure. They also all require some amount of upland space for sediment processing and material transloading which is expected to be available for all of the alternatives, so it does not impact the administrative feasibility of any alternative specifically. However, the relative footprints required for each alternative differ and are noted in the Phase I EE/CA to indicate the relative impacts on the upland site. All of the alternatives will require that the material be transported off site through or near adjoining properties. Permitting (or meeting the substantive requirements of permitting) will be similar for all of the alternatives, because they all consist of removing a predetermined volume of material. Stormwater management may be a consideration for Alternative A, because geotextile tubes rely on a large amount of exposed surface for dewatering, but the stormwater could be managed appropriately for any of the alternatives. Wastewater discharge issues will be the same for all alternatives because the water treatment process will produce the same quality of water for all alternatives. The only difference will be in the quantity of water discharged: Alternatives A and B will discharge the greatest amount of water, followed by Alternative D, then Alternative C. However, discharge quantities will not impact the process.

State Acceptance

The State of New Jersey provided input on the EE/CA during its preparation and agrees with the preferred response action.

Community Acceptance

Community acceptance of the preferred response action will be assessed in the Action Memorandum following review of the public comments received on the EE/CA and this document in writing and at the public meeting.

Cost

Alternative C is the lowest cost alternative, followed by Alternative D, Alternative B, and finally Alternative A.

A - $53,900,000

B - $49,100,000

C - $44,700,000

D - $45,100,000

PREFERRED RESPONSE ACTION

The recommended alternative is Alternative C: Mechanical Removal with Mechanical Dewatering. Alternative C will remove 40,000 cubic yards of sediment within a sheet pile enclosure. The conceptual design anticipates that the sheet piles for this enclosure will be driven into a deep silty clay layer with low permeability. A sealant will be applied to the joints to reduce the interlock permeability.

These measures will contain resuspended sediment within the Phase I Work Area, preventing its dispersion to the maximum extent practicable. The depth of the sheet piles and the sealant will limit hydraulic connectivity between the Phase I Work Area, the Passaic River, and the Diamond Alkali site. The sheet pile enclosure will protect the existing Diamond Alkali site floodwall and adjacent bulkheads from construction damage and maintain the stability of those structures, while providing excavation support.

The sediment and debris will be removed using a mechanical dredge or a long-reach excavator. The removed sediment will be placed on barges within the sheet pile enclosure. The dredges, barges, and other equipment associated with the Phase I Work will be contained within the enclosure. Ambient river water or recycled treated water from the water treatment plant will be pumped into the enclosure as needed to maintain appropriate water depth within the Phase I Work Area during removal.

Spillage from the barges will be minimized by using barges with a closed rail edge and by preventing barge overflow. The sediment and debris will be unloaded and transferred to the upland processing site using excavators located on the shore. An approach to limit spillage during the second handling step from the barges to the upland processing site would be to place the sediment directly into a hopper on a barge. The hopper would serve the same function as the Grizzly screen to remove debris. After the sediment has passed through the hopper, it would be slurried on the barge and pumped to the upland processing site for sediment processing. Following processing, the stockpiled sediment and debris will be covered with plastic sheeting or a similar cover to prevent rewetting of the processed sediment. Appropriate materials handling and housekeeping practices will be implemented throughout the sediment processing and transloading operations to prevent spillage and/or the erosion and dispersion of the removed sediment by stormwater to the extent practicable. Such practices will include covering exposed portions of the sediment processing and constructing appropriate runoff controls. Sealed intermodal containers will be inspected for leaks or spillage prior to being transported off site for disposal.

Construction monitoring will be conducted before, during, and after the project. Details of this work will be defined during design, but will include periodic sampling/observations of in-river water quality, ambient air, water treatment discharge, sheet pile deflection and bathymetry. In addition to routine environmental monitoring, appropriate measures to control worker health and safety will also be taken.

Alterative C will take approximately 29 weeks to complete removal and backfilling. This does not account for subsequent activities (e.g., sheet pile removal, remaining off-site transport and disposal due to disposal facility capacity constraints, and demobilization).

Alternative C is recommended because it ranks higher overall in effectiveness and implementability than the other Phase I Work Alternatives evaluated. Conducting the removal within an enclosure will prevent, to the extent practicable, the dispersion of resuspended sediment. Dewatering the sediment and the use of sealed intermodal containers for transport to the treatment/disposal facility will prevent, to the extent practicable, the spillage, leakage, and the risk of the material being handled in an uncontrolled manner. Backfilling the Phase I Work Area will partially restore the habitat and allow for future habitat restoration. Alternative C process options consist of proven technologies that are available, though there are constraints on the availability of off-site treatment and disposal facilities.

Mechanical removal is well-suited to handle the presence of debris within the Phase I Work Area. Due to the deep removal depth required and the likely presence of metallic debris, debris surveys conducted during design are not likely to identify all of the debris present in the Phase I Work Area; therefore, using a removal method that is able to adapt to unidentified debris and other obstructions is advantageous. Mechanical removal has a higher probability for successfully meeting the schedule in the AOC, given the lower risk for decreases in dredging production rates than the other removal methods. Mechanical removal methods are more effective at removing material in close proximity to the existing shoreline structures. Mechanical processing is suitable for dewatering high plasticity, fine-grained sediment like that in the Phase I Work Area. Mechanical dewatering methods will reduce the potential that additional drying of the sediment, through stockpiling, is needed to reduce moisture content. Based on the considerations provided above, Alternative C exhibits the greatest overall ability to meet the requirements of the evaluation criteria and, for that reason, is the recommended Phase I Work Alternative.